CLAIMS

1. A polymer electrolyte membrane comprising a microporous polymer membrane having pores penetrating through the opposite sides thereof, the microporous polymer membrane containing a mixture of a polymer and a molten salt at a weight ratio of 1/99 to 99/1 and/or a molten salt.

2. The polymer electrolyte membrane according to claim 1, wherein the microporous polymer membrane contains the molten salt.

3. The polymer electrolyte membrane according to claim 1, wherein the microporous polymer membrane holds the mixture of the polymer and the molten salt in the pores thereof.

4. The polymer electrolyte membrane according to claim 1, wherein the microporous polymer membrane holds the mixture of the polymer and the molten salt in the pores thereof and on both sides thereof.

5. The polymer electrolyte membrane according to claim 1, wherein the microporous polymer membrane contains the molten salt in the pores thereof and has a layer comprising the mixture of the polymer and the molten salt provided on both sides thereof.

6. The polymer electrolyte membrane according to claim 1, wherein

the microporous polymer membrane has an average pore size of 0.01 to 50 μm.

7. The polymer electrolyte membrane according to claim 1, wherein the microporous polymer membrane comprises a heat-resistant polymer having no glass transition temperature below 100°C.

8. The polymer electrolyte membrane according to claim 7, wherein the heat-resistant polymer is a heat-resistant aromatic polymer.

9. The polymer electrolyte membrane according to claim 1, wherein the microporous polymer membrane is a microporous polyimide membrane.

10. The polymer electrolyte membrane according to claim 9, wherein the polyimide constituting the microporous polyimide membrane comprises at least 1 mol% of 3,3'-dihydroxy-4,4'-diaminobiphenyl based on the total diamine component.

11. The polymer electrolyte membrane according to claim 1, wherein the microporous polymer membrane has a percentage of void of 10 to 90% by volume.

12. The polymer electrolyte membrane according to claim 1, wherein the polymer of the mixture is a cation exchange group-containing

polymer.

13. The polymer electrolyte membrane according to claim 12, wherein the cation exchange group is a sulfonic group, a carboxyl group or a phosphonic group, and the cation exchange group-containing polymer has an ion exchange capacity of 0.3 to 7 meq/g.

14. The polymer electrolyte membrane according to claim 1, wherein the molten salt has an ammonium ion as a cation component.

15. The polymer electrolyte membrane according to claim 1, which has a content of the mixture of the polymer and the molten salt of 1 to 99% by weight.

16. The polymer electrolyte membrane according to claim 1, which has a content of the molten salt of 1 to 90% by volume.

17. A process of producing a polymer electrolyte membrane containing a molten salt characterized by infiltrating the molten salt into pores of a microporous polymer membrane, comprising immersing the microporous polymer membrane having pores penetrating through the opposite sides thereof in the molten salt.

18. The process of producing a polymer electrolyte membrane according to claim 17, wherein the molten salt is infiltrated into the pores

of the microporous polymer membrane with vacuum degassing and/or pressurizing.

19. A process of producing a polymer electrolyte membrane containing a mixture of a polymer and a molten salt characterized by having the mixture of a polymer and a molten salt held in a microporous polymer membrane, comprising immersing the microporous polymer membrane having pores penetrating through the opposite sides thereof in a solution of the mixture of a polymer and a molten salt at a weight ratio of 1/99 to 99/1 in a solvent incapable of dissolving the microporous polymer membrane and infiltrating the solution into the microporous polymer membrane and removing the solvent by drying.

20. The process of producing a polymer electrolyte membrane according to claim 19, wherein the mixture is infiltrated into the microporous polymer membrane with vacuum degassing and/or pressurizing.

21. A process of producing a polymer electrolyte membrane characterized by forming a layer of the mixture of a polymer and a molten salt on both sides of a microporous polymer membrane, comprising immersing the microporous polymer membrane having pores penetrating through the opposite sides thereof in a molten salt, infiltrating the molten salt into the pores of the microporous polymer membrane, applying a solution of a mixture of a polymer and a molten salt at a weight ratio of

1/99 to 99/1 in a solvent incapable of dissolving the microporous polymer membrane to both sides of the microporous polymer membrane, and removing the solvent by drying.

22. The process of producing a polymer electrolyte membrane according to claim 21, wherein the molten salt is infiltrated into the pores of the microporous polymer membrane with vacuum degassing and/or pressurizing.